

IN THE CLAIMS:

Please amend Claims 1, 13, 30, 33 and 35 as follows. Note that all claims currently pending in this application, including those presently being amended, have been reproduced below.

1. (Currently Amended) An optical encoder comprising:
light irradiating system;
an optical scale having a grating for transmitting or reflecting incident light;
four light-receiving elements disposed essentially in a plurality of different directions line; and
an optical system constructed so as to amplitude-modulate light traveling from said light irradiating system to said optical scale and transmitted or reflected by the grating, by a dividing element in which a plurality of V-shaped grooves are juxtaposed, and so as to divide the amplitude-modulated light into beams along a plurality of different directions to guide the beams to the respective light-receiving elements;
wherein said dividing element is comprised of repetitions of such structure that a plurality of V-grooves, each having two consisting of planes of mutually different slope angles, are juxtaposed at a predetermined pitch to form four beams having different phases arranged for reception by the four light-receiving elements.

2. (Previously Presented) The optical encoder according to Claim 1, wherein said four beams form two sets of beams having a phase relation of 180°.

3. (Original) The optical encoder according to Claim 2, wherein said dividing element comprises repetitions of four types of different planes.

4. (Original) The optical encoder according to Claim 1, wherein said dividing element and said optical scale are comprised of a common member.

5. (Original) The optical encoder according to Claim 4, wherein a portion functioning as said dividing element of said common member is provided in an outside region or in an inside region of said grating.

6 to 12. (Cancelled).

13. (Currently Amended) An optical encoder comprising:
light irradiating system;
an optical scale comprising scale slits of a periodic structure;
a light-receiving element; and
an optical system constructed so as to make light traveling from said light irradiating system to the scale slits of a first region of said optical scale, incident to the scale slits of a second region of said optical scale by a mirror or another optical element to guide the light having passed via the scale slits of the second region to said light-receiving element;

wherein in said optical scale the scale slits of said first and second regions are comprised of grooves of V-shaped cross section and slope angles of the V-shaped cross

section in the first region are different from slope angles of the V-shaped cross section in the second region,

and wherein slope angles are different from each other between the grooves of the V-shaped cross section of the scale slits in said first and second regions to form four beams having different phases.

14. (Original) The optical encoder according to Claim 13, wherein the slope angles of the V-shaped grooves of the scale slits in said first region are smaller than those in said second region.

15. (Original) The optical encoder according to Claim 13, said optical encoder being used for detection of an angle or a speed of relative rotation of said optical scale.

16 to 29. (Cancelled).

30. (Currently Amended) A driving system comprising:
a driver system;
a control system for controlling driving of said driver system; and
an optical encoder for detecting information on the driving of said driver system to output a signal to said control system, said optical encoder comprising:
(1) light irradiating system;

(2) an optical scale having a grating for transmitting or reflecting incident light;

(3) ~~separate~~ four light-receiving elements disposed essentially in a plurality of different directions line; and

(4) an optical system constructed so as to amplitude-modulate light traveling from said light irradiating system to said optical scale and transmitted or reflected by the grating, by a dividing element in which a plurality of V-shaped grooves are juxtaposed, and so as to divide the amplitude-modulated light into beams along a plurality of different directions to guide the beams to the respective separate light-receiving elements;

wherein said dividing element is comprised of repetitions of such structure that a plurality of V-grooves, each of which has two ~~consisting of~~ planes of mutually different slope angles, are juxtaposed at a predetermined pitch to form four beams having different phases arranged for reception by the four light-receiving elements.

31 to 32. (Cancelled).

33. (Currently Amended) A driving system comprising:

a driver system;

a control system for controlling driving of said driver system; and

an optical encoder for detecting information on the driving of said driver system to output a signal to said control system, said optical encoder comprising:

(1) light irradiating system;

(2) an optical scale comprising scale slits of a periodic structure;

(3) a light-receiving element; and

(4) an optical system constructed so as to make light traveling from said light irradiating system to the scale slits of a first region of said optical scale, incident to the scale slits of a second region of said optical scale by a mirror or another optical element to guide the light having passed, via the scale slits of the second region to said light-receiving element;

wherein in said optical scale the scale slits of said first and second regions are comprised of grooves of V-shaped cross section and slope angles of the V-shaped cross section in the first region are different from slope angles of the V-shaped cross section in the second region; and

wherein slope angles are different from each other between the grooves of the V-shaped cross section of the scale slits in said first and second regions to form four beams having different phases.

34. (Cancelled).

35. (Currently Amended) A driving system comprising:

a driver system;

a control system for controlling driving of said driver system; and

an optical encoder for detecting information on the driving of said driver system to output a signal to said control system, said optical encoder comprising:

(1) light irradiating system;

(2) an optical scale comprising scale slits of a periodic structure;

(3) a light-receiving element; and

(4) an optical system constructed so that light traveling from said light irradiating system to the scale slits of a first region of said optical scale and reflected by the first region is reflected and condensed via only one condensing mirror onto the scale slits of a second region of said optical scale and so that the light having passed via the scale slits of the second region is guided to said light-receiving element,

wherein the first region and second region are adjacently positioned along a radial direction.